# PATENT SPECIFICATION

841,560

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**International Classification:—H03h.**



COMPLETE SPECIFICATION

DRAWINGS ATTACHED

## Improvements relating to T Filter Circuits

We, ELECTRIC AND MUSICAL INDUSTRIES LIMITED, a British Company of Blyth Road, Hayes, Middlesex, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to T filter circuits, especially to resonant bridged-T rejector circuits intended for use in colour television receivers.

In a colour television receiver it is necessary that the intermediate frequency amplifier should have a passband extending without substantial attenuation almost up to the sound intermediate frequency. This in turn involves the use of a rejector circuit with a very sharp rejection band, for the rejection of sound signals from the video channel. To meet this requirement a rejector circuit having a "Q" of several thousand is required and in general it is possible to realise this high "Q" by using resonant bridged-T rejector circuit such as illustrated in Figure 1 of the drawings accompanying the Provisional Specification. The various references used in this figure are self explanatory, the resistor R1 compensating for losses in the inductor L1 and the capacitor C3 (the two capacitors of twice the value of C3 being equivalent to a capacitor C3). In a representative case of such a rejector circuit, where the intermediate frequency range of vision signals is from 34 to 38 Mc/s and a sharp rejection of 40 db is required at 38.5 Mc/s together with a loss of only 1 db or so at 38 Mc/s, the rejector cannot have more than a certain inductance-to-capacitance ratio, and must have an effective minimum "Q" of about 8,000. In practice it is difficult to obtain a coil having a "Q" of over 250, and therefore the resistor R1 is called upon to increase the "Q" by a factor of about 32. It is known that for a symmetrical bridged-T rejector, $R1=Z_{D_0}/4$ where $Z_{D_0}$ is the dynamic impedance of the tuned circuit without R1, and depends upon the values of L1, the "Q" of L1 and the "Q" of C3. It can be shown that to obtain the required increase of "Q", R1 must be within about 3 per cent of $Z_{D_0}/4$. However, normal commercial resistors have a tolerance substantially exceeding this value. The tolerance can be taken up by using a variable resistor, but on account of the expense of such resistors this expedient is undesirable for television receivers.

The object of the present invention is to provide an alternative and less expensive expedient for taking up the tolerance which arises in cases such as above.

According to the present invention there is provided a resonant bridged-T filter circuit having a mainly resistive arm including a fixed resistance which has a tolerance exceeding the accuracy required to achieve a desired rejection characteristic, and wherein a variable reactor is connected in said arm to enable the circuit to be adjusted to a closer tolerance so that the desired rejection characteristic can be achieved.

In order that the present invention may be clearly understood and readily carried into effect, the same will be described with reference to the drawings accompanying the Provisional Specification, in which:—

Figure 1 illustrates a conventional bridged-T rejector circuit as described above,

Figure 2 illustrates one example of a rejector circuit according to the present invention,

Figure 3 illustrates a second example of such a rejector circuit,

Figure 4 illustrates a further example of such a circuit, and

Figure 5 illustrates a still further example

**[Price 3s. 6d.]**

according to the present invention.

According to Figure 2, a variable inductor L3 is connected in series with the resistor R2 in the shunt arm of a resonant bridged-T circuit, which is otherwise similar to that shown in Figure 1. Resistor R2 is smaller than the ideal value indicated for R1 in the case of Figure 1 and virtually exact compensation is achieved by adjustment of the inductor L3. Slight readjustment of the variable element in the tuned circuit is also required.

The resistor R2 may for example have a tolerance of 20% and in this case an inductor L3 whose maximum at the relevant frequency is of the order of one quarter the nominal impedance of the resistor may be used.

Figures 3 and 4 illustrate other forms of resonant bridged-T circuits in which a variable inductor is used in series with the shunt resistor.

The variable inductor and shunt resistor of Figures 2 to 4 may be combined in a single component by use of resistance wire to form the coils of the inductor.

A variable capacitor may alternately be used instead of a variable inductor as illustrated in Figure 5, where the variable capacitor is denoted by the reference C4. A similar capacitor can of course be used in circuits such as is shown in Figures 3 and 4.

The invention may be applied to other forms of resonant bridged-T circuits, for example circuits in which the resistor is connected in a series arm, and in this case the variable reactor would also be connected in the series arm.

While the invention is especially intended for use as a sound rejector circuit in a colour television receiver, the invention can have other applications where a similar rejection characteristic is required.

WHAT WE CLAIM IS:—

1. A resonant bridged-T filter circuit having a mainly resistive arm, including a fixed resistance which has a tolerance exceeding that required to achieve a desired rejection characteristic, and wherein a variable reactor is connected in said arm to enable the circuit to be adjusted to a closer tolerance so that the desired rejection characteristic can be achieved.

2. A circuit according to Claim 1 wherein said resistance is provided by the use of resistance wire in said inductor.

3. A circuit substantially as herein described with reference to Figure 2, 3, 4 or 5 of the drawings accompanying the Provisional Specification.

4. A television receiver comprising a circuit according to any preceding claim.

A. B. LOGAN,
Chartered Patent Agent.

PROVISIONAL SPECIFICATION

## Improvements relating to Bridged-T Rejector Circuits

We, ELECTRIC AND MUSICAL INDUSTRIES LIMITED, a British Company of Blyth Road, Hayes, Middlesex, hereby declare this invention to be described in the following statement:—

This invention relates to bridged-T rejector circuits, especially intended for use in colour television receivers.

In a colour television receiver it is necessary that the intermediate frequency amplifier should have a passband extending without substantial attenuation almost up to the sound intermediate frequency. This in turn involves the use of a rejector circuit with a very sharp rejection band, for the rejection of sound signals from the video channel. To meet this requirement a rejector circuit being "Q" to several thousand is required and in general it is possible to realise this high "Q" by using a bridged-T rejector circuit such as illustrated in Figure 1. The various references used in this figure are self explanatory, the resistor R1 compensating for losses in the inductor L1 and the capacitor C3. In a representative case of such a rejector circuit, where the intermediate frequency range of vision signals is from 34 to 38 Mc/s and a sharp rejection of 40 db is required at 38.5 Mc/s together with a loss of only 1 db or so at 38 Mc/s, the rejector cannot have more than a certain inductance-to-capacitance ratio, and must have an effective minimum "Q" to about 8,000. In practice it is difficult to obtain a coil having a "Q" of over 250, and therefore the resistor R1 is called upon to increase the "Q" by a factor of about 32. It is known that for a symmetrical bridged-T rejector, $R1=Z_{D_0}/4$ where $Z_{D_0}$ is the dynamic impedance of the tuned circuit without R1, and depends upon the values of L1, the "Q" of L1 and the "Q" of C3. It can be shown that to obtain the required increase of "Q", R1 must be within about 3 per cent of $Z_{D_0}/4$. However, normal commercial resistors have a tolerance exceeding this value. The tolerance can be taken up by using a variable resistance, but on account of the expense of such resistors this expedient is undesirable for television receivers.

The object of the present invention is to provide an alternative and less expensive expedient for taking up the tolerance.

According to the present invention there is provided a bridged-T rejector circuit having a fixed resistor in the shunt arm, the tolerance of which exceeds the accuracy required to achieve a desired rejection char-

acteristic, and wherein a variable reactor is connected in series with said resistor in the shunt arm to take up the tolerance of the resistor so that the desired rejection characteristic can be achieved.

Several forms of the invention are illustrated in the accompanying drawings. Thus, according to Figure 2 a variable inductor L3 is connected in series with the resistor R2 in the shunt arm of a bridged-T circuit, which is otherwise similar to that shown in Figure 1. R2 is smaller than the ideal value indicated for R1 in the case of Figure 1 and exact compensation is achieved by adjustment of the inductor L3. Slight readjustment of the variable element in the tuned circuit is also required.

Figures 3 and 4 illustrate others forms of bridged-T circuits in which a variable inductor is used in series with the shunt resistor.

A variable capacitor may alternately be used instead of a variable inductor as illustrated in Figure 5, where the variable capacitor is denoted by the reference C4. A similar variable capacitor can of course be used in circuits such as shown in Figures 3 and 4.

In further forms of the invention a capacitor can be connected across a variable inductor in the shunt arm, such as shown in Figure 2, and the invention may be applied to other known forms of bridged-T circuits.

While the invention is especially intended for use as a sound rejector circuit in a colour television receiver, the invention can have other applications where a similar rejection characteristic is required.

Dated this 20th day of September, 1955.

A. B. LOGAN,

Chartered Patent Agent.

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841,560 PROVISIONAL SPECIFICATION

1 SHEET

*This drawing is a reproduction of the Original on a reduced scale.*

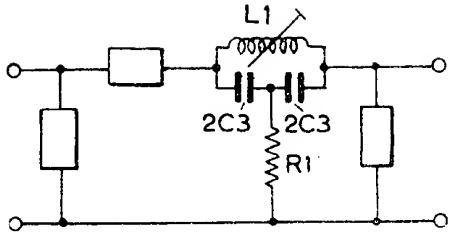


FIG. 1.

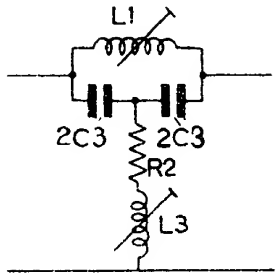


FIG. 2.

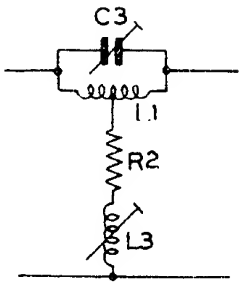


FIG. 3.

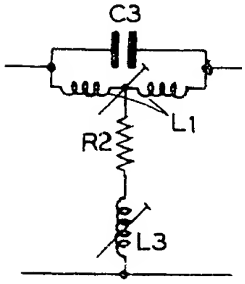


FIG. 4.

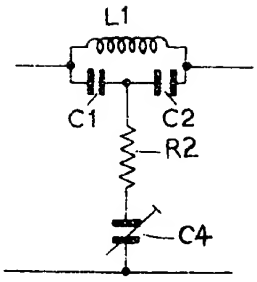


FIG. 5.